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PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

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US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
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in its capacity as elected Office

Date of mailing (day/month/year) 07 December 2000 (07.12.00)	
International application No. PCT/EP00/02822	**Applicant's or agent's file reference** N.79297 RJB
International filing date (day/month/year) 30 March 2000 (30.03.00)	**Priority date** (day/month/year) 02 April 1999 (02.04.99)
Applicant ANNONIER, Claude et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

19 October 2000 (19.10.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Aino Metcalfe

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

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NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

BARLOW, Roy, James
J.A. Kemp & Co.
14 South Square
Gray's Inn
London WC1R 5LX
ROYAUME-UNI

Date of mailing (day/month/year) 07 December 2000 (07.12.00)	
Applicant's or agent's file reference N.79297 RJB	**IMPORTANT NOTIFICATION**
International application No. PCT/EP00/02822	**International filing date** (day/month/year) 30 March 2000 (30.03.00)

1. The following indications appeared on record concerning:

[X] the applicant [X] the inventor [ ] the agent [ ] the common representative

Name and Address	State of Nationality	State of Residence
MALLARACH, Juan C/Arnau de Corco, 49 E-08560 Manlleu, Barcelona Spain	ES	ES
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address	State of Nationality	State of Residence
MALLARACH CAPDEVILA, Juan C/Arnau de Corco, 49 E-08560 Manlleu, Barcelona Spain	ES	ES
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : A23P 1/08

A1

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(30) Priority Data:
99/04143 2 April 1999 (02.04.99) FR

(71) Applicant *(for all designated States except US)*: AVENTIS ANIMAL NUTRITION SA [FR/FR]; 42, Avenue Aristide Briand, F–92160 Antony (FR).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: ANNONIER, Claude [FR/FR]; Aventis Animal Nutrition SA, 42, Avenue Aristide Briand, F–92160 Antony (FR). NUFFER, Sebastien [FR/FR]; Aventis Animal Nutrition SA, 42, Avenue Aristide Briand, F–92160 Antony (FR). MALLARACH, Juan [ES/ES]; C/Arnau de Corco, 49, E–08560 Manlleu, Barcelona (ES).

(74) Agents: BARLOW, Roy, James et al.; J.A. Kemp & Co., 14 South Square, Gray's Inn, London WC1R 5LX (GB).

(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: SPRAYING EQUIPMENT

(57) Abstract

The present invention relates to a novel piece of equipment for spraying a liquid composition onto a solid product e.g. a foodstuff which may be in the form of pellets, a crumble, a powder to form a mash. It relates more particularly to apparatus which allows homogeneous spraying of very small amounts of a liquid constituent onto relatively large amounts of the solid product.

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SPRAYING EQUIPMENT

The present invention relates to a novel piece of equipment for spraying a liquid additive composition onto a solid product, for example a foodstuff. It relates more particularly to apparatus which allows homogeneous spraying of very small amounts of a liquid constituent onto relatively large amounts of solid product.

The term "solid product" as used herein is intended to embrace a product in the form of pellets, or in the form of a crumble, or in the form of a powder which can be used to form a mash feed.

A preferred application of the present invention relates to apparatus for spraying liquid food additives which are to be present in the foodstuff in small weight amounts and which consist essentially of enzymes and/or vitamins and/or carotenoids. The said additives are often added in very small quantities of the order of a few tens or hundreds of grams per ton of foodstuffs.

In the prior art there are various examples of mixing additives to a major constituent, for example in US-A-4108335, US-A-5516625 and DE-A-4413249.

Where the major constituent receiving the additive minor constituent is in solid form it has been proposed previously to dilute the additive in a carrier liquid, for example as proposed in WO-A-97/16964. Another example of dilution of the additive is disclosed as one optional possibility in Patent EP 789291, where there is described apparatus comprising:

- one or more thermostatted containers which contain the enzyme which may be in pre-diluted form;
- a system for extracting the liquid enzyme from its container;
- a flow regulation valve;
- a flow meter with high sensitivity;
- an injection system which has an adjustable angle of atomization; and
- a microprocessor-controlled electronic system

for regulating the dose of the liquid enzyme.

Although this spraying system, which is very efficient and has been used commercially for many years, allowed the introduction of a liquid food additive which might be in pre-diluted form, it was not constructed with a view to allowing continuous variation of dilution. With use it appeared that this system was not perfectly adapted for enzymes which had to be introduced at different concentrations, or for the introduction of several different constituents which are mutually incompatible, whether from a physical or chemical point of view.

Thus, the introduction of additives such as enzymes in aqueous solution could not be carried out with the concomitant introduction of additives in lipid form such as the vitamins A or E, or proteases could not be introduced with protein enzymes.

In the prior system, the dilution of the enzyme was determined in advance and the quantity of diluted enzyme was adjusted by the microprocessor-controlled flow meter to be related to the amount of foodstuff which passed on a conveyor belt. With this system, there was a constant adaption of the flow rate of the spraying flow to the amount of dry foodstuffs transported by the conveyor belt.

However, it has now been found, unexpectedly, that it is easier and more advantageous to adapt the dilution of the additive in the diluent (water) both to the amount of dry foodstuffs transported by a conveyor belt and to the flow of the additive so as to keep the total spraying flow constant for a constant flow rate of dry foodstuffs.

Thus, the present invention relates to a spraying device for spraying onto a solid product an additive and a diluent therefor, consisting of:

- a diluent container;
- a further container for a said additive;
- a mixer;

- conduits communicating said diluent container and additive container with said mixer for allowing the dilution of the additive by the diluent from said diluent container;

- spraying means connected to receive the output from said at least one mixer with a constant flow rate and a constant flow of solid product and to spray it at a spray zone; and

- means for transporting solid product to solid spray zone to receive the additive;

- characterised in that in said conduits there is a respective regulation valve per liquid associated with the first mentioned and further containers; in that there are dilution control means for controlling said regulation valves to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of additive(s) in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate.

The present invention preferably employs static mixers.

The transporting means may be a conveyor and the regulation valves may be managed by a microprocessor which, according to the weight of solid product present on the conveyor where the additive/ diluent mixture is sprayed, modulates the proportional flow rate of the different additives and diluent in such a way as to maintain a spraying flow rate which is constant and proportional to the weight of solid product.

If, according to Figure 1, the flow is followed starting from the water container(1), the liquid is pumped by the pump (3) as far as the flow meter (4), then is introduced into a regulation valve (5) before being introduced into the mixer (6).

If the flow is followed starting from the first additive container (2), the liquid is pumped by the pump (3) as far as the flow meter (4), then is introduced into a regulation valve (5) before being introduced into the mixer (6). This is the case for each further additive.

The mixture of water and several different additives is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8) on a flow of granules. Although the granules may be travelling on a conveyor, e.g. a horizontal belt conveyor it is preferable for them to be sprayed while dropping vertically from a pelleting chiller. Any other transport means for the solid product can be used.

When several of the additives cannot be mixed together in the aqueous flow, several spraying systems may be individually adapted to the throughput of the apparatus, so as to give a variable application of each additive to the solid product, while maintaining optimum flow through the spray nozzle. It is evident that, even if the additives are mutually compatible, it may be advantageous to adapt several spraying nozzles to the outlet of the apparatus.

The advantages of the present device are as follows:

- homogeneous distribution of the liquid additive(s) onto the foodstuff
- regulation of the flow rate of one of the additives without necessarily disturbing the functioning of the atomization nozzle
- conformity with the statutory demands on premixed additives
- mixing of mutually unstable products.

It has been found that with the system of the present invention it is possible to achieve a wide variation in the flow rates of the various liquids, and a precisely controlled application rate of the at least one additive to the solid product. For example, the

application rate of any one of the additives can be in the range of from 1 litre to 15 litres per hour, and as an example it is possible for two separate additives to be introduced to the diluent water flow, one at the rate of 1 litre per hour and the other at a flow rate of 15 litres per hour.

In order to maintain optimum flow conditions at the spray nozzle, the flow of water will be selected so as to provide the required flow rate which may be in the range of from 20 - 100 litres per hour per spray nozzle.

Using such values, it is possible to achieve a homogeneous application of from 0.5 to 1 litre of an additive per tonne of solid foodstuff granules passing through the apparatus.

Although throughout the present application there is reference to a solid product to which the additive/diluent mixture is applied, this is intended to denote that the product is not flowable, and in the preferred use of the apparatus the solid product will be a dry product, preferably in granular form.

CLAIMS

1. A device for spraying onto a solid product an additive and a diluent therefor, consisting of:

- a diluent container (1);
- a further container (2) for a said additive;
- a mixer (6);
- conduits communicating said diluent container and additive container (1 and 2) with said mixer (6) for allowing the dilution of the additive by the diluent from said diluent container (1);
- spraying means (7) connected to receive the output from said at least one mixer with a constant flow rate and a constant flow of solid product and to spray it at a spray zone; and
- means for transporting solid product to said spray zone receive the additive;
- characterised in that in said conduits there is a respective regulation valve (5) per liquid associated with the first mentioned and further containers (1, 2); in that there are dilution control means for controlling said regulation valves (5) to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of additive(s) in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate.

2. A device according to claim 1, characterised in that there are several additive containers (2) connected to said mixer, each said additive container being associated with a respective additive flow meter (4) and additive flow regulation valve (5)

3. A device according to claim 1, characterised in that the or each mixer is a static mixer.

4. A device according to claim 1, characterised in that the transporting means comprise a conveyor and the control means are in the form of a microprocessor responsive to the weight of solid product present on the conveyor.

5. A device according to any one of claims 1 to 4, characterised in that there are several said further containers communicating with a common said mixer (6);

- and in that the control means modulates the proportional flow rate of each of the different additives in response to the amount of solid product.

6. A device according to any one of claims 1 to 3, characterised in that, in use of the device, liquid is pumped by the diluent pump (3) from the diluent container (1) as far as a diluent flow meter (4) and then introduced into the associated diluent regulation valve (5) before being introduced into the mixer (6);

- in that liquid is pumped by the or each additive pump (3) from the additive container (2) as far as a flow meter (4) for the additive and then introduced into an additive regulation valve (5) before being introduced into the mixer (6);

- and in that the mixture of diluent(s) and additive is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8).

7. A device according to claim 6 characterised in that the transporting means comprise means for releasing said solid product to fall vertically through the spray zone.

8. A device according to any one of claims 1 to 4, characterised by several spraying systems (7) each able to be adapted to the throughput of solid product.

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/EP 00/02822

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23P1/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23P B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 44 13 249 A (CAMMANN GERHARD) 19 October 1995 (1995-10-19) cited in the application the whole document	1,3
A	US 4 738 219 A (FUJISAWA ATUHISA) 19 April 1988 (1988-04-19) abstract figure column 3, line 13 -column 4, line 67	1,3
A	WO 97 16964 A (HARDI INT AS ;BJUGSTAD NILS (NO)) 15 May 1997 (1997-05-15) cited in the application abstract page 8, line 5 -page 12, line 19 figures	1-8

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
2 August 2000	09/08/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Boddaert, P

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Interr nal Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	US 5 916 625 A (JONES DONALD B ET AL) 29 June 1999 (1999-06-29) figure column 1, line 6 - line 8 column 2, line 48 - line 63 column 4, line 27 - line 35 column 4, line 51 - line 67	1
A	US 4 108 335 A (HOFF CARL PRESTON ET AL) 22 August 1978 (1978-08-22) cited in the application abstract figure 1 column 2, line 46 -column 4, line 20	1,3
A	US 3 894 690 A (HILL RAYMOND G) 15 July 1975 (1975-07-15)	
A	EP 0 789 291 A (MANGRA S A) 13 August 1997 (1997-08-13) cited in the application	

INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Inter ...nal Application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication dat
DE 4413249 A	19-10-1995	NONE	
US 4738219 A	19-04-1988	JP 63012363 A	19-01-1988
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		US 6055926 A	02-05-2000

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: SPRAYING EQUIPMENT

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The present invention relates to a novel piece of equipment for spraying a liquid composition onto a solid product e.g. a foodstuff which may be in the form of pellets, a crumble, a powder to form a mash. It relates more particularly to apparatus which allows homogeneous spraying of very small amounts of a liquid constituent onto relatively large amounts of the solid product.

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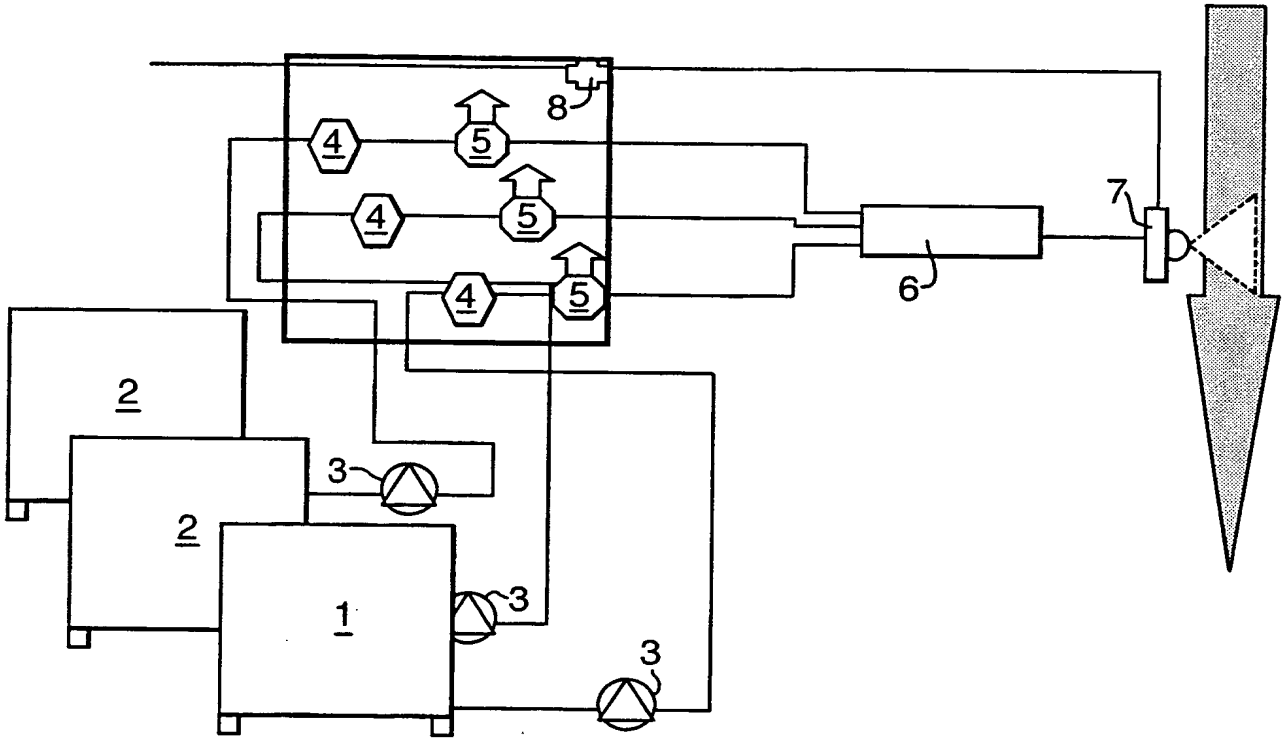
Fig.1.



INTERNA NAL SEARCH REPORT

Inter[illegible]nal Application No
PCT/EP 00/02822

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23P1/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23P B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

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A	WO 97 16964 A (HARDI INT AS ;BJUGSTAD NILS (NO)) 15 May 1997 (1997-05-15) cited in the application abstract page 8, line 5 -page 12, line 19 figures	1-8

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 August 2000	09/08/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL – 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer
Boddaert, P

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/02822

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
P,A	US 5 916 625 A (JONES DONALD B ET AL) 29 June 1999 (1999-06-29) figure column 1, line 6 - line 8 column 2, line 48 - line 63 column 4, line 27 - line 35 column 4, line 51 - line 67	1
A	US 4 108 335 A (HOFF CARL PRESTON ET AL) 22 August 1978 (1978-08-22) cited in the application abstract figure 1 column 2, line 46 -column 4, line 20	1,3
A	US 3 894 690 A (HILL RAYMOND G) 15 July 1975 (1975-07-15)	
A	EP 0 789 291 A (MANGRA S A) 13 August 1997 (1997-08-13) cited in the application	

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 00/02822

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 4413249	A	19-10-1995	NONE		
US 4738219	A	19-04-1988	JP	63012363 A	19-01-1988
WO 9716964	A	15-05-1997	AU	709685 B	02-09-1999
			AU	7490296 A	29-05-1997
			EP	0957682 A	24-11-1999
			NO	982080 A	07-05-1998
US 5916625	A	29-06-1999	US	5993913 A	30-11-1999
US 4108335	A	22-08-1978	NONE		
US 3894690	A	15-07-1975	US	3967920 A	06-07-1976
EP 0789291	A	13-08-1997	AU	696002 B	27-08-1998
			AU	5903096 A	24-12-1996
			JP	10505697 T	02-06-1998
			NZ	309089 A	19-12-1997
			US	6055926 A	02-05-2000

AMENDED CLAIMS

[received by the International Bureau on 6 October 2000 (06.10.00); original claims 1-8 replaced by new claims 1-10 (3 pages)]

1. A device for spraying onto a solid product an additive diluted with a diluent therefor, consisting of:

- a diluent container (1);
- a further container (2) for a said additive;
- a mixer (6);
- conduits communicating said diluent container and additive container (1 and 2) with said mixer (6) for allowing the dilution of the additive by the diluent from said diluent container (1);
- spraying means (7) connected to receive the output from said at least one mixer with a constant flow rate and a constant flow of solid product and to spray it at a spray zone; and
- means for transporting solid product to said spray zone receive the additive;
- characterised in that in said conduits there is a respective regulation valve (5) per liquid associated with the first mentioned and further containers (1, 2); in that there are dilution control means for controlling said regulation valves (5) to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of additive(s) in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate.

2. A device according to claim 1, characterised in that one or more conduits connecting a diluent container or an additive container to a mixer are associated with respective flow meters.

3. A device according to claim 1, characterised in that there are several additive containers (2) connected to said mixer, each said additive container being associated with a respective additive flow meter (4) and additive flow

regulation valve (5)

4. A device according to claim 1, characterised in that the or each mixer is a static mixer.

5. A device according to claim 1, characterised in that the transporting means comprise a conveyor and the control means are in the form of a microprocessor responsive to the weight of solid product present on the conveyor.

6. A device according to any one of claims 1 to 5, characterised in that there are several said further containers communicating with a common said mixer (6);

- and in that the control means modulates the proportional flow rate of each of the different additives in response to the amount of solid product.

7. A device according to any of claims 1 to 5, characterised in that a flow of gas is provided to the spraying means to assist the spraying at a constant rate.

8. A device according to any one of claims 1 to 3, characterised in that, in use of the device, liquid is pumped by the diluent pump (3) from the diluent container (1) as far as a diluent flow meter (4) and then introduced into the associated diluent regulation valve (5) before being introduced into the mixer (6);

- in that liquid is pumped by the or each additive pump (3) from the additive container (2) as far as a flow meter (4) for the additive and then introduced into an additive regulation valve (5) before being introduced into the mixer (6);

- and in that the mixture of diluent(s) and additive is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8).

9. A device according to claim 8 characterised in that the transporting means comprise means for releasing said solid product to fall vertically through the spray zone.

10. A device according to any one of claims 1 to 5, characterised by several spraying systems (7) each able to

be adapted to the throughput of solid product.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
N.79297 RJB		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP00/02822	30/03/2000	02/04/1999
International Patent Classification (IPC) or national classification and IPC A23P1/08		
Applicant AVENTIS ANIMAL NUTRITION SA et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19/10/2000	29.06.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer MARZANO MONTERO.., M Telephone No. +49 89 2399 2902

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/02822

I. Basis of the r port

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1,4,5	as originally filed			
2,3	as received on	27/02/2001	with letter of	27/02/2001

Claims, No.:

1-8	as received on	27/02/2001	with letter of	27/02/2001

Drawings, sheets:

1/1	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-8
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-8
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-8
	No:	Claims	

2. Citations and explanations
   see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

It m V:

1. Document WO-A-9716964, cited in the description, discloses a device for spraying an additive diluted with a diluent therefor having all the features of the preamble of claim 1. Namely, a devoice having a diluent container, a further container for an additive, a mixer, conduits communicating the containers with said mixer, spraying means to receive the output of the mixer, means to transport a product to a spray zone to receive the additive. Furthermore the conduits are provided with a control valve, governed by dilution control means which are responsible to vary the flow of diluent in response to desired total flow rate of liquid to said spraying means in order to maintain a constant flow rate.
   In order to ensure a more effective spraying of the additive to the product, the characterizing portion of claim 1 specifies that the control means are in form of a microprocessor responsive to the weight of solid product present on the means to transport said product.
   Such teaching is not mentioned in the above cited document, which relates namely to the spraying of additives onto plants and in no way the weight of the product on which the additive is to be sprayed is taken into account by the control means which governs the dilution of the spray.
   Thus, claim 1 is considered to fulfill the requirements of Art. 33(2) and (3) PCT with regards to novelty and inventive step.

2. Claims 2-8 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Item VIII:

This preliminary report has been drafted intending the word 'conveyor' in claim 1 as 'means for transporting a solid product', so that it is clear that the control means are responsive to the weight of the product present on the transport means which are actually part of the claimed device.

CLAIMS

1. A device for spraying onto a solid product an additive and a diluent therefor, consisting of:

- a diluent container (1);
- a further container (2) for a said additive;
- a mixer (6);
- conduits communicating said diluent container and additive container (1 and 2) with said mixer (6) for allowing the dilution of the additive by the diluent from said diluent container (1);
- spraying means (7) connected to receive the output from said at least one mixer with a constant flow rate and a constant flow of solid product and to spray it at a spray zone; and
- means for transporting solid product to said spray zone receive the additive;
- characterised in that in said conduits there is a respective regulation valve (5) per liquid associated with the first mentioned and further containers (1, 2); in that there are dilution control means for controlling said regulation valves (5) to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of additive(s) in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate.

2. A device according to claim 1, characterised in that there are several additive containers (2) connected to said mixer, each said additive container being associated with a respective additive flow meter (4) and additive flow regulation valve (5)

3. A device according to claim 1, characterised in that the or each mixer is a static mixer.

Replaced by Article 34

4. A device according to claim 1, characterised in that the transporting means comprise a conveyor and the control means are in the form of a microprocessor responsive to the weight of solid product present on the conveyor.

5. A device according to any one of claims 1 to 4, characterised in that there are several said further containers communicating with a common said mixer (6);

- and in that the control means modulates the proportional flow rate of each of the different additives in response to the amount of solid product.

6. A device according to any one of claims 1 to 3, characterised in that, in use of the device, liquid is pumped by the diluent pump (3) from the diluent container (1) as far as a diluent flow meter (4) and then introduced into the associated diluent regulation valve (5) before being introduced into the mixer (6);

- in that liquid is pumped by the or each additive pump (3) from the additive container (2) as far as a flow meter (4) for the additive and then introduced into an additive regulation valve (5) before being introduced into the mixer (6);

- and in that the mixture of diluent(s) and additive is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8).

7. A device according to claim 6 characterised in that the transporting means comprise means for releasing said solid product to fall vertically through the spray zone.

8. A device according to any one of claims 1 to 4, characterised by several spraying systems (7) each able to be adapted to the throughput of solid product.

- conduits communicating said diluent container and additive container with said mixer for allowing the dilution of the additive by the diluent from said diluent container;

- spraying means connected to receive the output from said at least one mixer with a constant flow rate and a constant flow of solid product and to spray it at a spray zone; and

- means for transporting solid product to solid spray zone to receive the additive;

- characterised in that in said conduits there is a respective regulation valve per liquid associated with the first mentioned and further containers; in that there are dilution control means for controlling said regulation valves to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of additive(s) in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate.

The present invention preferably employs static mixers.

The transporting means may be a conveyor and the regulation valves may be managed by a microprocessor which, according to the weight of solid product present on the conveyor where the additive/ diluent mixture is sprayed, modulates the proportional flow rate of the different additives and diluent in such a way as to maintain a spraying flow rate which is constant and proportional to the weight of solid product.

If, according to Figure 1, the flow is followed starting from the water container(1), the liquid is pumped by the pump (3) as far as the flow meter (4), then is introduced into a regulation valve (5) before being introduced into the mixer (6).

for regulating the dose of the liquid enzyme.

Although this spraying system, which is very efficient and has been used commercially for many years, allowed the introduction of a liquid food additive which might be in pre-diluted form, it was not constructed with a view to allowing continuous variation of dilution. With use it appeared that this system was not perfectly adapted for enzymes which had to be introduced at different concentrations, or for the introduction of several different constituents which are mutually incompatible, whether from a physical or chemical point of view.

Thus, the introduction of additives such as enzymes in aqueous solution could not be carried out with the concomitant introduction of additives in lipid form such as the vitamins A or E, or proteases could not be introduced with protein enzymes.

In the prior system, the dilution of the enzyme was determined in advance and the quantity of diluted enzyme was adjusted by the microprocessor-controlled flow meter to be related to the amount of foodstuff which passed on a conveyor belt. With this system, there was a constant adaption of the flow rate of the spraying flow to the amount of dry foodstuffs transported by the conveyor belt.

However, it has now been found, unexpectedly, that it is easier and more advantageous to adapt the dilution of the additive in the diluent (water) both to the amount of dry foodstuffs transported by a conveyor belt and to the flow of the additive so as to keep the total spraying flow constant for a constant flow rate of dry foodstuffs.

Thus, the present invention relates to a spraying device for spraying onto a solid product an additive and a diluent therefor, consisting of:

- a diluent container;
- a further container for a said additive;
- a mixer;

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

To:
J.A. KEMP & CO.
Attn. Barlow, Roy James
14 South Square
Gray's Inn
London WC1R 5LX
UNITED KINGDOM

Applicant's or agent's file reference N.79297 RJB	Date of mailing *(day/month/year)* 09/08/2000
International application No. PCT/EP 00/ 02822	FOR FURTHER ACTION See paragraphs 1 and 4 below
Applicant AVENTIS ANIMAL NUTRITION SA et al.	International filing date *(day/month/year)* 30/03/2000

1. [X] The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Fascimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. [ ] The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. [ ] **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

[ ] the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

[ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Emmanuel Cherqui

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international pbulication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How? Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped),whether

(i) the claim is unchanged;

(ii) the claim is cancelled;

(iii) the claim is new;

(iv) the claim replaces one or more claims as filed;

(v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."

2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."

3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."

4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international appplication is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
N.79297 RJB		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP 00/ 02822	30/03/2000	02/04/1999
Applicant		
AVENTIS ANIMAL NUTRITION SA et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

[ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

[ ] contained in the international application in written form.

[ ] filed together with the international application in computer readable form.

[ ] furnished subsequently to this Authority in written form.

[ ] furnished subsequently to this Authority in computer readble form.

[ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

[X] the text is approved as submitted by the applicant.

[ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

[X] the text is approved as submitted by the applicant.

[ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. _____

[ ] as suggested by the applicant.

[X] because the applicant failed to suggest a figure.

[ ] because this figure better characterizes the invention.

[ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/02822

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23P1/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23P B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 44 13 249 A (CAMMANN GERHARD) 19 October 1995 (1995-10-19) cited in the application the whole document ---	1,3
A	US 4 738 219 A (FUJISAWA ATUHISA) 19 April 1988 (1988-04-19) abstract figure column 3, line 13 -column 4, line 67 ---	1,3
A	WO 97 16964 A (HARDI INT AS ;BJUGSTAD NILS (NO)) 15 May 1997 (1997-05-15) cited in the application abstract page 8, line 5 -page 12, line 19 figures --- -/--	1-8

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family.

Date of the actual completion of the international search	Date of mailing of the international search report
2 August 2000	09/08/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Boddaert, P

2

Form PCT/ISA/210 (second sheet) (July 1992)

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International Application No
PCT/EP 00/02822

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	US 5 916 625 A (JONES DONALD B ET AL) 29 June 1999 (1999-06-29) figure column 1, line 6 - line 8 column 2, line 48 - line 63 column 4, line 27 - line 35 column 4, line 51 - line 67	1
A	US 4 108 335 A (HOFF CARL PRESTON ET AL) 22 August 1978 (1978-08-22) cited in the application abstract figure 1 column 2, line 46 -column 4, line 20	1,3
A	US 3 894 690 A (HILL RAYMOND G) 15 July 1975 (1975-07-15)	
A	EP 0 789 291 A (MANGRA S A) 13 August 1997 (1997-08-13) cited in the application	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 00/02822

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4413249 A	19-10-1995	NONE	
US 4738219 A	19-04-1988	JP 63012363 A	19-01-1988
WO 9716964 A	15-05-1997	AU 709685 B	02-09-1999
		AU 7490296 A	29-05-1997
		EP 0957682 A	24-11-1999
		NO 982080 A	07-05-1998
US 5916625 A	29-06-1999	US 5993913 A	30-11-1999
US 4108335 A	22-08-1978	NONE	
US 3894690 A	15-07-1975	US 3967920 A	06-07-1976
EP 0789291 A	13-08-1997	AU 696002 B	27-08-1998
		AU 5903096 A	24-12-1996
		JP 10505697 T	02-06-1998
		NZ 309089 A	19-12-1997
		US 6055926 A	02-05-2000

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BARLOW, Roy James
J.A. KEMP & CO.
14 South Square
Gray's Inn
London WC1R 5LX
GRANDE BRETAGNE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing *(day/month/year)*	29.06.2001
Applicant's or agent's file reference N.79297 RJB	IMPORTANT NOTIFICATION

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP00/02822	30/03/2000	02/04/1999

Applicant
AVENTIS ANIMAL NUTRITION SA et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Riebel, O Tel.+49 89 2399-2967

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
N.79297 RJB		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP00/02822	30/03/2000	02/04/1999
International Patent Classification (IPC) or national classification and IPC		
A23P1/08		
Applicant		
AVENTIS ANIMAL NUTRITION SA et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19/10/2000	29.06.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer MARZANO MONTERO.., M Telephone No. +49 89 2399 2902

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/02822

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, pages:

1,4,5	as originally filed			
2,3	as received on	27/02/2001	with letter of	27/02/2001

Claims, No.:

1-8	as received on	27/02/2001	with letter of	27/02/2001

Drawings, sheets:

1/1	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-8
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-8
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-8
	No:	Claims	

2. Citations and explanations
   see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Item V:

1. Document WO-A-9716964, cited in the description, discloses a device for spraying an additive diluted with a diluent therefor having all the features of the preamble of claim 1. Namely, a devoice having a diluent container, a further container for an additive, a mixer, conduits communicating the containers with said mixer, spraying means to receive the output of the mixer, means to transport a product to a spray zone to receive the additive. Furthermore the conduits are provided with a control valve, governed by dilution control means which are responsible to vary the flow of diluent in response to desired total flow rate of liquid to said spraying means in order to maintain a constant flow rate.
   In order to ensure a more effective spraying of the additive to the product, the characterizing portion of claim 1 specifies that the control means are in form of a microprocessor responsive to the weight of solid product present on the means to transport said product.
   Such teaching is not mentioned in the above cited document, which relates namely to the spraying of additives onto plants and in no way the weight of the product on which the additive is to be sprayed is taken into account by the control means which governs the dilution of the spray.
   Thus, claim 1 is considered to fulfill the requirements of Art. 33(2) and (3) PCT with regards to novelty and inventive step.

2. Claims 2-8 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Item VIII:

- This preliminary report has been drafted intending the word 'conveyor' in claim 1 as 'means for transporting a solid product', so that it is clear that the control means are responsive to the weight of the product present on the transport means which are actually part of the claimed device.

for regulating the dose of the liquid enzyme.

Although this spraying system, which is very efficient and has been used commercially for many years, allowed the introduction of a liquid food additive which might be in pre-diluted form, it was not constructed with a view to allowing continuous variation of dilution. With use it appeared that this system was not perfectly adapted for enzymes which had to be introduced at different concentrations, or for the introduction of several different constituents which are mutually incompatible, whether from a physical or chemical point of view.

Thus, the introduction of additives such as enzymes in aqueous solution could not be carried out with the concomitant introduction of additives in lipid form such as the vitamins A or E, or proteases could not be introduced with protein enzymes.

In the prior system, the dilution of the enzyme was determined in advance and the quantity of diluted enzyme was adjusted by the microprocessor-controlled flow meter to be related to the amount of foodstuff which passed on a conveyor belt. With this system, there was a constant adaption of the flow rate of the spraying flow to the amount of dry foodstuffs transported by the conveyor belt.

However, it has now been found, unexpectedly, that it is easier and more advantageous to adapt the dilution of the additive in the diluent (water) both to the amount of dry foodstuffs transported by a conveyor belt and to the flow of the additive so as to keep the total spraying flow constant for a constant flow rate of dry foodstuffs.

Thus, the present invention relates to a device for spraying an additive diluted with a diluent therefor, consisting of:

- a diluent container;
- a further container for a said additive;
- at least one mixer;
- conduits communicating said diluent container and

additive container with said mixer for allowing the dilution of the additive by the diluent from said diluent container;

- spraying means connected to receive the output from said at least one mixer with a constant flow rate and to spray it at a spray zone; and
- means for transporting a solid product to said spray zone to receive the additive;
- wherein in said conduits there is a respective regulation valve per liquid associated with the first mentioned and further containers; there are dilution control means for controlling said regulation valves to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of the additive in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate;
- characterised in that the spray nozzle is aimed towards a conveyor for a solid product to be sprayed, and in that the control means are in the form of a microprocessor responsive to the weight of solid product present on the conveyor.

The present invention preferably employs static mixers.

The transporting means may be a conveyor and the regulation valves may be managed by a microprocessor which, according to the weight of solid product present on the conveyor where the additive/ diluent mixture is sprayed, modulates the proportional flow rate of the different additives and diluent in such a way as to maintain a spraying flow rate which is constant and proportional to the weight of solid product.

If, according to Figure 1, the flow is followed starting from the water container(1), the liquid is pumped by the pump (3) as far as the flow meter (4), then is introduced into a regulation valve (5) before being introduced into the mixer (6).

CLAIMS

1. A device for spraying an additive diluted with a diluent therefor, consisting of:

- a diluent container (1);
- a further container (2) for a said additive;
- at least one mixer (6);
- conduits communicating said diluent container and additive container (1 and 2) with said mixer (6) for allowing the dilution of the additive by the diluent from said diluent container (1);
- spraying means (7) connected to receive the output from said at least one mixer with a constant flow rate and to spray it at a spray zone; and
- means for transporting a solid product to said spray zone to receive the additive;
- wherein in said conduits there is a respective regulation valve (5) per liquid associated with the first mentioned and further containers (1, 2); there are dilution control means for controlling said regulation valves (5) to control the rates of flow of the diluent and additive to said mixer, said dilution control means being responsive to the flow of solid product being conveyed by said transporting means to control the rate of flow of the additive in proportion to the flow of solid product, and being effective to vary the flow of diluent in response to the desired total flow rate of liquid to said spraying means to maintain a constant total flow rate;
- characterised in that the spray nozzle is aimed towards a conveyor for a solid product to be sprayed, and in that the control means are in the form of a microprocessor responsive to the weight of solid product present on the conveyor.

2. A device according to claim 1, characterised in that one or more conduits connecting a diluent container or an additive container to a mixer are associated with

respective flow meters.

3. A device according to claim 1, characterised in that there are several additive containers (2) connected to said mixer, each said additive container being associated with a respective additive flow meter (4) and additive flow regulation valve (5)

4. A device according to claim 1, characterised in that the or each mixer is a static mixer.

5. A device according to any one of claims 1 to 4, characterised in that there are several said further containers communicating with a common said mixer (6);

- and in that the control means modulates the proportional flow rate of each of the different additives in response to the amount of solid product.

6. A device according to any of claims 1 to 5, characterised in that a flow of gas is provided to the spraying means to assist the spraying at a constant rate.

7. A device according to any one of claims 1 to 3, characterised in that, in use of the device, liquid is pumped by the diluent pump (3) from the diluent container (1) as far as a diluent flow meter (4) and then introduced into the associated diluent regulation valve (5) before being introduced into the mixer (6);

- in that liquid is pumped by the or each additive pump (3) from the additive container (2) as far as a flow meter (4) for the additive and then introduced into an additive regulation valve (5) before being introduced into the mixer (6);

- and in that the mixture of diluent(s) and additive is sprayed by an injector (7) with a constant flow rate assisted by a flow of air (8).

8. A device according to any one of claims 1 to 5, characterised by several spraying systems (7) each able to be adapted to the throughput of solid product.